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Problems and Countermeasures for Local Universities in International S&T Cooperation --An example of C University in Western China

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Abstract

International scientific and technological (S&T) cooperation is a necessary requirement for local universities to meet in development process. Local universities have been actively engaged and made great achievements in international S&T cooperation, though they still have significant problems with the resource, personnel, cooperation level, etc. According to the inductive research, countermeasures are proposed in various aspects of local universities such as international S&T cooperation management mechanism, integration of preponderant discipline resources, and high-level cooperation achievements.

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I. INTRODUCTION

With economic globalization, scientific and technological(S&T) resources were freely allocated and rapidly transferred without geographical boundaries and industrial barriers in the world, to promote reasonable and effective allocation of knowledge and innovation resources[1, 2]. International S&T cooperation is an inevitable trend of advancement in science and technology, and an important way for a country, especially a developing country, to achieve great leap-forward development in science and technology[3, 4].

From overall development of international scientific community, China still has a long way to go to achieve a world-class scientific research level. This is mainly reflected in the relatively few important basic theories put forward and not enough achievements and contributions made by Chinese scientists [1]. Consequently, China has limited say in international academic community, with overall scientific research level temporarily below the world's advanced level [5]. Hence, according to the central government's guidelines for deepening international cooperation and the requirements of national major strategies, universities should strengthen international exchange and cooperation, and carefully learn and master the world's advanced ideas and technologies. Meanwhile, they should know international cutting-edge technologies and the latest discipline dynamics for the avoidance of unnecessary repeats and barriers, and put forward innovative research to the best of their knowledge. Local universities are one of important participants in international S&T cooperation and exchange, thus how to follow international S&T development trends, serve local

or regional development, explore academic frontier from an international perspective, and improve the quality and level of international S&T cooperation is a common concern among administrators, scientific researchers and foreign affairs workers of local universities. For international S&T cooperation among universities, Ganyushina et al[6] stated that the international cooperation between different universities should be developed to give everyone of different countries the opportunity to improve their international perspective and diversity knowledge reserve. Franco and Pinho[7] provided a wide perspective of the obstacles and benefits of international collaboration among University Research Centres. Numprasertchai and Igel[8] considered that international scientific collaboration play a fundamental role in creating new knowledge and obtaining competitive advantages. Melin[9] stated that selecting partners with certain resources and competences will be helpful to the successful completion of the international collaboration research.

C university is one of local universities with earlier and more international cooperation and exchange activities in China. In recent years, C university has attached great importance to international S&T cooperation. Every year, it receives a number of international excellent scholars for cooperation and exchange. Meanwhile, C university develops innovative international cooperation and exchange methods in accordance with national polices. Through taking C university's national scientific research platform N as an example, this paper sorts out the international exchanges and results achieved in scientific research for recent four years, and analyzes the existing problems, in order to provide a case reference for overall planning and development of international cooperation of local universities in China.

II. LOCAL UNIVERSITIES' CURRENT CONDITIONS IN INTERNATIONAL S& T COOPERATION

After hardworking for 40 years since the reform and opening-up, China has gradually formed a multi-level, multi-channel and all-round international S&T cooperation pattern, with various cooperation modes such as bilateral, multilateral, official and private cooperation. A survey for some local universities shows that they carry out international S&T cooperation and exchange mainly in the following forms.

2.1 Establishment of international S&T cooperation agency

Local universities actively strive for the great support from the Ministry of Science and Technology and local science and technology bureaus, to establish any research institution together with their foreign partners, or found any research institution to attract foreign experts to join in their research projects. For example, they've been building such platforms as national S&T cooperation demonstration base, Sino-foreign joint laboratory, new research institution, academician expert workstation, and workstation under the "Help Our Motherland through Elite Intellectual Resources from Overseas" Program ("Home Program"), and fully utilizing such platforms to gather global S&T resources, form a "talent-team-project-platform" model, and lay a solid foundation for international S&T cooperation. Local universities also actively strive to establish any provincial and even national agency for international S&T cooperation, because it's an effective way to deeply promote international S&T cooperation. The author's university introduces high-quality foreign S&T resources through relying on the "national S&T cooperation demonstration base". So far, it has successfully been authorized to conduct the following projects: Several international S&T cooperation projects, such as a special project for strategic international S&T innovation cooperation under the National Key Research and Development Program, a special

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project for intergovernmental S&T cooperation under the National Key Research and Development Program, a bilateral intergovernmental S&T exchange project, a special project under the Developing Country's Science and Technology Assistance Program, and a training class under the Developing Country's External S&T Assistance Program; international (regional) cooperation and exchange projects of National Natural Science Foundation; and projects under "EU Erasmus +".

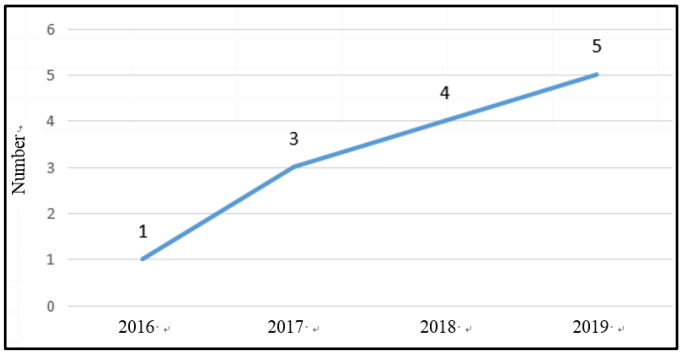

Fig 1. The total number of national international cooperation projects of C university in 2016-2019

2.2 Cooperation in scientific research and development

Universities actively integrate global scientific research resources to conduct cooperative or collaborative research projects, including cooperative research, joint investigation, and cooperative development. On the one hand, scientific and technical personnel from Chinese universities can proactively participate in researches under large international science and engineering programs; on the other hand, foreign experts are invited and attracted to conduct cooperative research and development in China. For example, the author's university has effectively utilized global science and technology resources to promote international S&T cooperation from a global perspective, in accordance with the "Belt and Road" Initiative, the "Southern Transport Corridor" Strategy Deployment, and the National Special Plan for International S&T Innovation Cooperation during the "13th Five-Year" Plan. It has conducted steady, broad and profound international S&T cooperation with many countries and regions in the world in terms of applied economics, business administration, management science and engineering, and other preponderant disciplines in the university, promoting the construction of "first-class disciplines" and making significant achievements thereof.

2.3 Exchange and cultivation of S&T talents

Generally, talent exchange and cultivation are centralized on "going global" and "bringing in". "Going global" includes students studying abroad, scholars visiting abroad, joint school running, joint training, and exchange program, as well as Chinese technology experts working in international S&T organizations or groups, etc. "Bringing in" refers to engaging foreign technology experts in research, lecture, consultation, and other activities in China. The author's university makes great efforts to introduce overseas high-end talents. By virtue of foreign high-end expert project, "Home Program" workstation, academician expert workstation, International outstanding youth's short-term work plan in China, etc., the author's university has established scientific research teams chaired by academicians, talents under the "Thousand Talents Program", and other high-end talents, to actively conduct international S&T cooperation under their leadership. The international cooperation and exchange on C university in 2016-2019 is shown in Table 1.

Tab 1 International cooperation and exchange on C university in 2016-2019

Year	Number of scholars visiting abroad	Number of host countries	Number of visiting foreign experts	Number of guest countries	Number of international conferences organized or co-organized	Number of international journals organized	Number of international training organized	Number of talents introduced	Number of agreements signed
2016	1	1	3	3	0	0	0	2	0
2017	5	3	54	16	3	0	1	5	3
2018	8	4	77	25	2	0	1	11	5

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2019	10	7	124	30	6	3	2	54	3

III. ANALYSIS OVER LOCAL UNIVERSITIES' PROBLEMS WITH INTERNATIONAL S&T COOPERATION

There is no doubt that local universities have made good progress in international S&T cooperation. Due to system and mechanism, staff quality, and other causes, however, local universities still suffer from the lower level, less significant results, and other deficiencies in international S&T cooperation. This paper focuses on the analysis of root causes.

3.1 Limited resources

On the one hand, local universities generally have financial constraints. Most of their funds are from a single source. They only rely on fiscal appropriation, and thus do not have enough funds to build their respective foreign network and create favorable conditions for international S&T cooperation. On the other hand, ministerial universities have significant discipline advantages and rich resources, and far surpass the peer in aspects of talent cultivation and international cooperation, which forms a virtuous circle but largely results in more fierce competition for local universities with a less long history in international S&T exchange and cooperation. Therefore, local universities need to strive for foreign and domestic resources with greater efforts.

3.2 The lack of multi-skilled managers in international S&T cooperation

Whether in ministerial universities or local universities, the scientific research department and department of foreign affairs (or international exchange and cooperation department) are set separately in the construction of organization structure in most cases. The scientific research department mainly manages scientific research projects and achievements, while the department of foreign affairs mainly takes charge of international exchange and cooperation affairs. The manager of the scientific research department is familiar with the research areas, application procedures, management measures, and other aspects of international cooperation projects, but often has no solid foreign language application fundamentals or good communication skills. The manager of the department of foreign affairs has international exchange experience and the ability to deal with international cooperation affairs, but knows little about scientific research. As a result, the two departments cannot fully integrate manpower, material and other resources to facilitate scientific researchers' more effective participation in international S&T exchange and cooperation.

3.3 Larger language barrier for scientific researchers in international scientific research cooperation

Due to a lack of a wide English-speaking atmosphere in universities, only a small number of scientific researchers from most universities, especially universities in Western China, can fluently speak English in international exchange. Their own language deficiency places them at a disadvantage in project negotiation. Besides, most scientific researchers have no knowledge about foreign cultural consciousness, S&T cooperation modes and standards, laws and regulations, and thus easily make detours or achieve half the result with twice the effort in the exchange process, which largely influences their work efficiency and cooperation process and depth.

3.4 Low international S&T cooperation level

At present, local universities carry out international S&T cooperation in relatively simple and stiff modes and at a low level. They just work for cooperation and do not consider their respective actual situation and local or regional development needs. This is mainly reflected in small goals and primary form of international S&T cooperation, and less enough high-level and signature achievements. Local universities are often used to the vertical comparison. Notwithstanding larger breakthroughs in the number and quality of scientific research output, they have less enough high-level and signature achievements from the perspective of

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international S&T development. As a result, the judgments over technology frontier and market are not accurate enough in setting goals in the initial period, and meanwhile it's very difficult to transform technological achievements in the later period.

IV. COUNTERMEASURES FOR LOCAL UNIVERSITIES IN INTERNATIONAL S&T COOPERATION

For main problems found in local universities' international S&T cooperation, the author proposes the following countermeasures (Figure 2).

4.1 Development of international S&T cooperation strategy

In the new international situation, there are new requirements and challenges for China to address in scientific research and international cooperation. According to the international S&T development trends, with deep and wide development of science and technology, the spatial scale and complexity of problems in scientific research mark the increasing globalization of scientific research. As cross-regional and global issues on the human living environment have become priorities and hot topics in the international scientific community, the globalization of scientific research will expand further and further and prevail in the future century. Therefore, we are required to conduct scientific research consistent with globalization trends and seize the opportunities and challenges from globalization, and attach importance to international cooperation and exchange. As one of the important fronts for scientific research, universities shall develop applicable international S&T cooperation strategies to guide their international S&T cooperation, in light of the international situation, national policies, local conditions, and their own actual situation.

4.2 Improvement of international S&T cooperation mechanism

Universities shall establish their own sharing mechanism for S&T resources. They shall integrate internal and external resources and promote the optimal allocation of scientific research resources to build a research platform operation mechanism based on the formation of a scientific research team; and make more efforts to strive for national, ministerial and provincial S&T resources to build sustainability mechanisms for university-enterprise cooperation and international S&T cooperation, especially the exchange mechanism for cooperation effect and sustainability. Local universities, especially those of science and technology type, shall conduct comprehensive international cooperation to improve the overall level of faculty. Historically, with technological development, it is necessary to achieve "catching up and surpassing"[10].

4.3 The building of international S&T cooperation system

In international S&T cooperation, local universities with limited resources shall change the large and overall traditional cooperation mode used in their international cooperation and exchange from the perspective of international cooperation; take full advantage of local characteristics and their preponderant disciplines to seek for cooperation with foreign high-level universities or scientific research institutions; explore a new way to create a mutually acceptable and win-win situation; and promote the connotative and scientific development of their international S&T cooperation; and develop a systematic international S&T cooperation model[11,12].

4.3.1. "Going global"

Universities shall actively encourage scientific researchers to go abroad and participate in international scientific research. For instance, they shall strengthen the improvement of young teachers' English language skills, encourage scientific researchers to study further and have academic visits overseas, and encourage postgraduates of the scientific research team to study and exchange abroad, so as to fully improve the internationalization level of the scientific research talent team[13]. They shall also encourage

scientific researchers to publish papers on international famous journals, and participate in international conferences at home and abroad. Participating in international academic conferences is an efficient and enhanced international exchange activity. International academic conferences can be basically classified into two categories: (1) systematic and interdisciplinary academic conferences that have board coverage and can reflect the frontier of relevant fields; and (2) international interdisciplinary academic conferences that involve new and professional research areas and emerging disciplines. International academic conferences where experts get together to create an obvious academic atmosphere can intensively reflect the latest developments of relevant disciplines and fields. Through participating in international conferences, scientific researchers can know the developments of relevant cutting-edge disciplines more quickly, and meanwhile establish relationships with many excellent scientists naturally through academic exchanges and discussions before, at and after the conferences. Therefore, participating in international conferences is an important way for scientists to establish relationships and start cooperation and for scientific researchers to go globally. Meanwhile, international S&T cooperation shall be enhanced by means of further mutual visit, an invitation to foreign scholars for lecture and research, etc[14]. All those forms are linked up organically, while maintaining their respective different features and functions.

4.3.2. "Bringing in"

Universities shall actively introduce excellent scientific research talents and teams from the international community, and fully use international high-quality scientific research resources to improve their own scientific research level. Meanwhile, they shall set goals in accordance with the development requirements for their own preponderant disciplines and local regional economy and research the content and form of international S&T cooperation in an in-depth manner, to improve their own international S&T cooperation level. Universities shall deeply integrate international talents and academic teams, fully utilize preponderant disciplines, carefully consider innovative fields and relevant requirements, and tightly seize the opportunity from national international S&T cooperation project requirements to make high-level achievements, especially iconic, integrated and systematic high-level scientific research achievements. It should be noted that the transformation of existing high-level achievements is widely publicized to improve the universities' international reputation and influence and lay a solid foundation for future international S&T cooperation[15,16]. In addition, universities shall accelerate the cultivation of scientific research and management talents for international S&T cooperation in line with new situation and requirements, and improve the service capabilities of their own international scientific research cooperation units such as the scientific research department, the department of foreign affairs, and the international scientific research platform[17]. Universities may develop their own training system for their administrators, and provide training on knowledge about international S&T cooperation and exchange for the administrators to improve their abilities in the process of S&T internationalization. They may also learn from the business model of the S&T Department of Tsinghua University, which established an International Scientific Research Project Office in 2000, expanded the S&T Department into the Office of Scientific R&D in 2004, and then established the Department of Overseas Department [18]. Such a specific establishment of administration is an effective reform that promotes the development of international S&T cooperation channels and the enhanced management of international S&T projects in universities. Furthermore, they shall undertake or organize international conferences to attract more international and domestic units and talents, widely communicate the information on relevant fields,

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grasp the dynamics of relevant fields, and create conditions for academic and talent exchange and cooperation between them and foreign universities. In doing so, they can achieve procedural publicity to some extent.

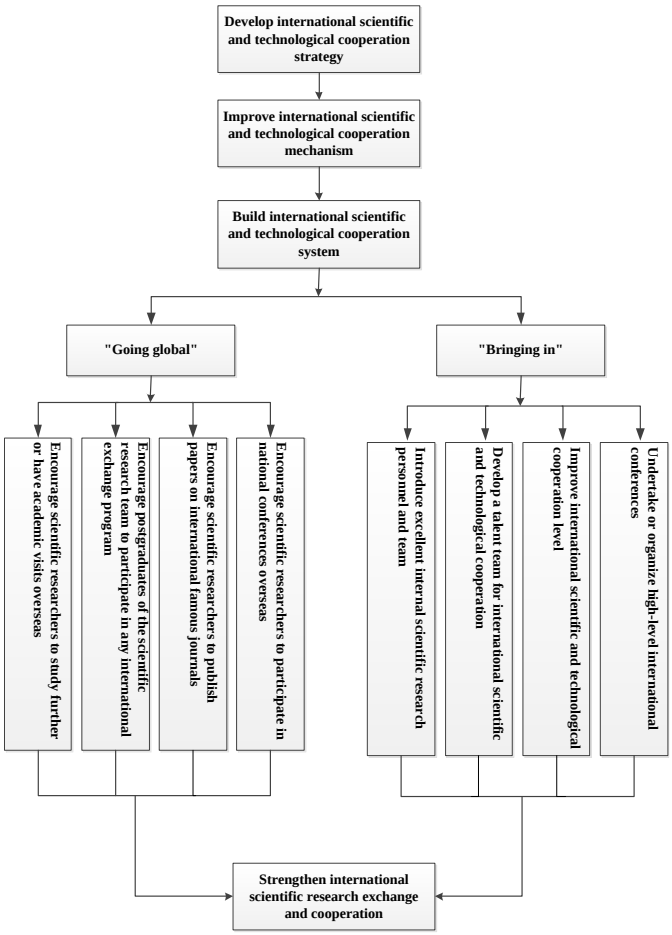

Fig 2: The systematic countermeasures for international S&T

V. CONCLUSION

In the general trend of international scientific research in universities, it is a long-term and arduous task for local universities to develop international S&T cooperation with limited resources. With the great advancement of international cooperation and the expansion of international cooperation scope in China, there are many opportunities and a larger space for local universities to develop international S&T cooperation in both width and depth. Scientific researchers will compete, exchange and cooperate with each other more in the global and networked open environment. The globalization of scientific research will continue. Globalization will have a significant and far-reaching influence on the object, direction, scope and level of scientific research, the ways of academic exchange and cooperation between scientific researchers, and the development of interdisciplinary research. Universities shall develop international S&T cooperation strategies from an international perspective. They shall make overall arrangement and planning to establish practical and feasible international S&T cooperation mechanisms, and meanwhile improve their S&T cooperation systems. With a firm belief that they can develop into high-level universities, local universities shall explore and develop innovative international S&T cooperation modes and continue improving international S&T cooperation level to promote the high-quality development of universities, in accordance with local advantages, universities' features and the development direction of international S&T cooperation and with a priority to development.

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